MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2013/2014

FOURTH YEAR FIRST SEMESTER EXAMINATIONS FOR THE
DEGREE OF BACHELOR OF SCIENCE IN EARTH SCIENCE WITH
INFORMATION TECHNOLOGY

(MAIN CAMPUS)

NGA 401: SURFACE AND GROUNDWATER MODELLING

Date: 19th November, 2013   Time: 2.30 - 4.30 p.m.

INSTRUCTIONS:

- **Answer Question ONE and any other TWO questions.**
- **Sketch maps and diagrams should be used whenever appropriate.**

NGA 401: SURFACE AND GROUNDWATER MODELLING

1. a). Examine the significance of systems approach to hydrological modelling. (12 marks)

    b). Describe the components of a hydrological time series. (8 marks)

    c). Discuss the importance of groundwater modelling. (10 marks)

2. Explain the procedure of fitting a simple conceptual model. (20 marks)

3. Discuss the principle of Nash model and its application in hydrology. (20 marks)

4. Examine the application of stochastic modelling in solving hydrological problems. (20 marks)

5. a). Examine the Clark's method of unit hydrograph analysis. (12 marks)

    b). A 30-min unit hydrograph for a catchment is given in the table below.

Time (min)	Runoff (m³/s)	Time (min)	Runoff (m³/s)
0	0	210	0.91
30	1.2	240	0.74
60	2.8	270	0.61
90	1.7	300	0.50
120	1.4	330	0.28
150	1.2	360	0.17
180	1.1	390	0

Estimate the runoff from the following 90-min storm:

Time (min)	Rainfall excess (cm)
0-30	3.1
30-60	2.5
60-90	1.7

(20 marks)

6. Consider a soil with a retention curve shown in the table below.

Elevation above water table (m)	Moisture content
0	0.18
0.5	0.16
1.0	0.15
1.5	0.14
2.0	0.11
2.5	0.08
3.0	0.06
3.5	0.05
4.0	0.05
4.5	0.05
5.0	0.05

If the water table was initially 1.5m below the ground surface and falls to 3m below the ground surface:

i) Compute specific yield of the aquifer.   (14 marks)

ii) Determine if the specific yield is any different if the water table had fallen from 3.5m to 5m below the ground surface,   (6 marks)